Appendices for Tables, Figures, References

Appendix A. 2

Systematic Review Tables and Figures 2

Table 3. Search Strategy 2
Table 4. Study Demographics 3
Table 5. Key Results 5
Table 6. JBI Critical Appraisal Checklist for Analytical Cross Sectional & Cohort Studies 6

Appendix B. 7

References 7

Appendix C 13

Table 7. Current Equipment Template 13
Table 8. Environmental Access Template 14
Table 9. Device Determination Template 15
Table 10. Device Components 17
Table 11. Device Components Example 21
Table 12. K0005 Measurements Template 23
Table 13. ROM and Strength Assessment Template 24
Table 14. Orthostatic Vital Signs Template 25
Table 15. FTSST Template 25
Table 16. 30STS Template 25
Table 17. 10MWT Template 26
Table 18. OLST Template 26
Table 19. Abbreviated FGA Template 27
Table 20. Balance Assessment Template 27
Figure 5. Wheelchair Type Decision Tree 28
Figure 6. MWC K0005 Rigid Frame Models by User Weight 29
Figure 7. MWC K0005 Folding Frames Models by User Weight 29
Figure 8. Alternative Drive Controls Decision Tree 30
Figure 9. Tire Selection & Delivery Caution 31
Figure 10. Wheelchair Propulsion Patient Handout Triceps Version 32
Figure 11. Wheelchair Propulsion Patient Handout No Triceps Version 32
Figure 12. Wheelchair Scale Platform Diagram 33

Appendix A.

Systematic Review Tables and Figures

Table 1. Search Strategy

Search Number	Category	Terms	PubMed	Embase
#1	Device	**Title/Abstract:** wheelchair* OR "wheeled mobility" OR "mobility device*" **MeSH:** Wheelchairs **Emtree:** wheelchair	11,389	20,721
#2	WC Type	**Title/Abstract:** manual	143,743	206,844
#3	Quality & Factors	**Title/Abstract:** utilization OR satisfaction OR quality OR disparit* OR custom* **MeSH:** Patient Satisfaction OR Personal Satisfaction **Emtree:** Satisfaction	2,355,104	3,286,136
#4	Combined	#1 AND #2 AND #3	300	449

Table 4 Study Demographics

Table 2. Study Demographics

U = Ultralight
L = Lightweight
S = Standard/Depot
B = L+ S (non-aggregated)

	MWCUsers	MWC Type	Veterans	Sex (F)	Race	Age (years)	Diagnosis
Ambrosio 2007‡	1003	U, B	100%	7.7%*	21.3% POC	54.4 ± 12.8*	MS; SCI
Cuppett 2023‡	607	U, B	≲ 8.8%#	54.2%	NR	62.3 ± 16.2*	AR, CVA, SCI, MS
Fitzgerald 2007‡	457	U, L, S	66.1%	25.6%†	25.2% POC	46.6 ± 11.7 †	SB, SCI, AMP, OI, AR, MS
Groah 2014‡	225	U, L	1.3%	23.7%*	44% POC*	44.3*	SCI
Hubbard 2007§	76,708	U, L, S	100%	6.0%*	38% POC*	67.4 ± 13.1 (2000)* 68.2 ± 12.1 (2001)*	COPD/CHF, CVA, AR, SCI
Hunt 2004‡	251	U, B	NR	21%*	49% POC	37.8 ± 11.9 †	SCI
Karmarkar 2009‡	100	U, L, S	73%	25%	NR	73.9 ± 8.1	SCI, CVA, O
Karmarkar 2011‡	216	U, L, S	likely high¶	27.4%†	NR	71.8 ± 9.5	SCI, CVA, AR, MS, COPD
Masselink 2022‡	129	U, B	≲ 36.4%#	46.9%*	NR	19-64 (76.5.2%)* 65+ (23.5%)*	CP, SCI/AMP/SB, CD, MSK
Myaskovsky 2017‡	159	U, L, S	100%	4.1%*	37.6% POC	58.1±12.4*	SCI, AMP
Schein 2021§	1901	U, B	NR	54%*	NR	61.12 ± 17.25*	SCI, CVA, CP, MS, OI
Sprigle 2019‡	522	U, B	NR	58%*	NR	>18 (28.2%) 18-40 (21.9%) 41-60 (23.9%) 61+ (26%)	NS, CD, INJ, MSK, CS
Winkler 2008‡	17,554	U, B	100%	3.1%†	26.9% POC	61.7±15.0†	COPD/CHF, CVA, AR, AMP, SCI, MS

* = data includes PWC users, † = calculated based off given data, ‡ = cross-sectional design, § = cohort design

¶ = data did not report veteran status but sampled from VA and public nursing homes

= based off reported % of participants having "other" funding sources including the VA

Not Reported (NR)

MWC Types: Ultralight (U), Lightweight (L), Standard (S), Basic Aggregated L+S (B)

Diagnoses: Amputation (AMP), Arthritis (AR), Congenital Disorder (CD), Chronic Heart Failure (CHF), Chronic Obstructive Pulmonary Disease (COPD), Cerebral Palsy (CP), Circulatory System (CS), Cerebral Vascular Accident/Stroke (CVA), Injury (INJ), Multiple Sclerosis (MS), Musculoskeletal (MSK), Neurological (NS), other not defined (O), Osteogenesis Imperfecta (OI), Spina Bifida (SB), Spinal Cord Injury (SCI)

Table 3. Key Results

	U	L	S	B	Key Results
Ambrosio 2007[17]	252	411	340	751	· V-MS 3.03x less likely to receive U vs B compared to V-SCI ($\chi^2 = 102.8$, $p < 0.001$).† · Authors suspect non-ambulators are more likely to receive U than non-functional ambulators · V-SCI significantly younger than V-MS (p=0.001, t=-4.32) · V-SCI more often POC than V-MS (67.9% vs 85.0%, $p < 0.001$, $\chi^2 = 123.41$).
Cuppett 2023[18]	567	NR	NR	40	· B had shortest delivery (t = 2.8, p =0.005, 95% CI (-35.9 to -6.5)), except within the Pacific (←CA, HI) (U: 84.2 days SD 38.1, B: 133.0 days SD 87.7). · Northeast (CT, MA, ME, NH, NY, RI, VT): longest U delivery at 223.9 days (SD 81.3). · Private insurance: U vs B similar delivery (126.2 days SD 72.8, 129.8 days SD 95.4). · Medicaid and Medicare: U took longer (118.5 SD 63.8, 118.8 SD 61.4) vs B (82.0 SD 38.5, 87.1 SD 42.1), still faster than private.
Fitzgerald 2007[13]	408	43	6	49	· Women significantly less likely to receive U than B ($\chi^2 = 21.7$, $p < .001$).† · U users (46 ± 11.5 yrs) younger than L (51 ± 11.3 yrs) and S (59 ± 15.3) users ($p < .05$). · Not significant for quality: race, ethnicity, veteran status
Groah 2014[14]	212	55	NR	55	· Self-pay (p<.01) and Medicare (p<.05) more likely to receive L than Private/Prepaid. · Not significant for quality: Private/Prepaid, Medicaid/DVR, workers comp/VA.
Hubbard 2007[11]	3,076	25,159	48,473	73,632	· Veterans Integrated Service Network (VISN = #) · Southwest (#21-22 states CA, NV, HI) provided proportionally more U vs B than all other regions (p<0.001).† · Northwest 5.2x (#19-20, AZ, NM, TX), Midwest 3.4x (#10-15, IA, IL, KS, MI, MN, MO, NE, ND, OH, SD, WI), Northeast 3.0x (#1-6, CT, DE, MA, MD, ME, NC, NH, NJ, NY, PA, RI, VA, VT, WV), and South 2.9x (#6-9, 16-18, AL, AR, AZ, FL, GA, KY, LA, MS, NM, OK, SC, TN, TX) less likely to get U vs B compared to Southwest(#21-22, CA, HI, NV).† · Notably Ohio prescribed no U.†
Hunt 2004[15]	166	NR	NR	5	· POC less likely to receive U vs White users (p=.006). · As level of education increased so did likelihood of U (p=.003). · Public insurance less likely to receive U than private (p=0.03). · As income increased so did likelihood of U (p=.03). · Not significant for quality: level of SCI, employment status, and years since SCI injury.
Karmarkar 2009[16]	24	61	15	76	· Community dwelling older adults (CDOA) more likely to have U vs B compared to nursing home (NH) (p<0.01).† · Private NH residents less likely to receive L than S compared to VA NH (p<0.01).†
Karmarkar 2011[19]	119	80	17	98	· Women less likely to receive U vs B (p<.01). · U users (67.7 ± 7.5 yrs) younger than L (77.4 ± 9.9 yrs) and S (77.5 ± 9.9) users ($p \leq .01$). · Users with SCI 2.3x more likely to receive U vs B (p<.01). · (CDOA) more likely to have U vs B compared to NH (p<0.01).†
Masselink 2022[20]	107	NR	NR	22	· Every 1+ yr of age decreased odds of mismatch delivery by 7% (p<0.001, 95% CI 1.04-1.10). Teen to early adult years when individuals may need smaller or larger equipment than typical for that age may be cause. · Not significant for mismatch: Insurance type, sex, and MWC type.
Myaskovsky 2017[21]	140	6	11	17	· Every 10+ year age increase odds of U decreased by 36% (p<0.01, 95% CI (0.46-0.90)). · Family income <$25,000 less likely to receive U vs B (p<0.01). · SCI center increased the likelihood of receiving U over B (p<0.01). · Veteran amputees 2.9x less likely to receive U vs SCI (p<0.01). · Not significant for quality: Black vs White veterans.
Schein 2021[12]	582	NR	NR	1,319	· ATP involvement increased likelihood of U by 9.3x (p<0.05). · B associated with lower FMA scores (p<0.05).
Sprigle 2019[22]	400	NR	NR	122	· Therapist involvement increased likelihood of U by 1.3x (p<0.01). · B Users are significantly more likely to have no aftersales services (p<0.01).
Winkler 2008[23]	760	NR	NR	16,794	· Female veterans significantly less likely to receive U (p<0.05). · More comorbidities were more likely to receive B (p<0.05).

					· Other Neuro (ALS, PD, CVA) 3.2x and Non-Neuro (AMP, AR, COPD/CHF) 6.7x less likely to receive U vs SCI ($p<0.01$).† · Veterans with U had lower physical function ($p \leq .0001$) but higher mental function SF-36V scores ($p < .05$). · Native Americans 1.6x less likely to receive U than White veterans ($p<0.05$). · Latino veterans 1.7x more likely to receive U than White veterans ($p<0.05$). · Not significant for quality: SCI vs MS, White, and Black, Pacific Islander, or Asian.

Table 4. JBI Critical Appraisal Checklist for Analytical Cross Sectional & Cohort Studies

	JBI Checklist	Ambrosio 2007	Cuppett 2023	Fitzgerald 2007	Groah 2014	Hunt 2004	Karmarkar 2009	Karmarkar 2011	Masselink 2022	Myaskovsky 2017	Sprigle 2019	Winkler 2008	Hubbard 2007	Schein 2021
All Designs	Valid/reliable exposure measure.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Confounding factors identified.	⚠	✓	✳	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Strategies for confounding factors stated.	⚠	✓	✳	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Valid/reliable outcome measure.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Appropriate statistical analysis.	⚠	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Cross Sectional	Clearly defined inclusion criteria.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✳	✳
	Adequate subject/setting detail.	✓	⊘	⊘	⊘	✓	⊘	⊘	⊘	⊘	⊘	✓	✳	✳
	Objective condition measurement criteria.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✳	✳
Cohort	Similar groups from same population.	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✓	✓
	Exposures measured in both groups.	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✓	✓
	Participants free of outcome at start.	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✓	⚠
	Sufficient follow up time.	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✓	✓
	Follow up complete/loss discussed.	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✓	✓
	Strategies addressed incomplete follow up.	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✳	✓	✳
✓ = Yes, ⊘ = No, ⚠ = Unclear/Partial, ✳ = N/A														

Appendix B.

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Appendix C.

Table 5. Current Equipment Template

Current Equipment	
Primary Mobility Device	Condition & Configuration
▣ None | Cane | Walker | Axillary Crutch | Forearm Crutch | Standard MWC | K4 MWC | K5 Folding MWC | K5 Rigid MWC | TIS | POV | G2 PWC | G3 PWC ▣ **Model:** *** **Age:** *** yrs old **Seating Functions:** ▣ NA | Elevation | Elevating Legrest | Tilt | Recline | Anterior Tilt ▣	▣ NA | Good | Fair | Disrepair Replacement Needed ▣ • Details*** ▣ NA | Good Fit | Poor Fit | Modifications Needed ▣ • Details***
Seat Cushion	Condition & Configuration
Model: *** **Type:** ▣ NA | General Use | Skin Protecting | Positioning | Skin Protecting & Positioning ▣ **Age:** *** yrs old	▣ NA | Good | Fair | Disrepair Replacement Needed ▣ • Details *** ▣ NA | Good Fit | Poor Fit | Modifications Needed ▣ • Details***
Backrest	Condition & Configuration
Model: *** **Type:** ▣ NA | General Use | Skin Protecting | Positioning | Skin Protecting & Positioning ▣ **Age:** *** yrs old	▣ Good | Fair | Disrepair Replacement Needed ▣ • Details*** ▣ Good Fit | Poor Fit | Modifications Needed ▣ • Details***
Reason for New Device Needed	
▣ Device is a loaner. | Not needed. | Modifications Only: *** | No longer meets pt's needs. | Change in medical status or condition. | Replacement needed due to age and wear. | Replacement needed due to irreparable damage. | Device was stolen. ▣	

Table 6. Environmental Access Template

Environmental Access	
Home	▣ apartment | house *** story | other ***▣
Home Entry	▣ level entry | ramp | building elevator | platform | *** steps | *** steps with plan to obtain ramp or lift | pt plans to move ▣
Home Accessible Spaces	▣ bedroom | toilet or commode | bath/shower | kitchen | living room | laundry space | workspace | none | pt plans to move ▣
Community	▣ urban | rural ▣
Work	***
School	***
Transportation	▣ public transit | paratransit | medical transport | drives | caregiver drives ▣
Personal Vehicle	▣ none | truck | sedan | coupe | hatchback | SUV | van | WAV ▣
Assistance/Support	▣ Unpaid Caregiver | Paid Aid | Nursing ▣

Table 9. Device Determination Template

Device Determination

Pt is dependent on a ▣ **K0004 Lightweight MWC | K0005 Ultralight MWC | Tilt-In-Space MWC** ▣ to meet their mobility related needs, it medically necessary and is the most appropriate, reasonable and cost-effective seating system. The recommended equipment is the least costly medically appropriate alternative.

Daily Usage: ▣ Fulltime (8-16hrs) | Parttime (2hrs) | Parttime (3-5hrs) | Parttime (6-7hrs) ▣

Expected Duration of Need: Lifetime

Sensory Impairments: ▣ None | Glasses | Visual Impairment | Blind | Hearing Aids | Cochlear Implant | Hard of Hearing | Deaf | Temperature Sensation | Skin Sensation | Pain Sensation ▣

Cognitive Impairment: ▣ None | Mild | Moderate | Severe ▣

Respiratory Impairment: ▣ Asthma | COPD | Labored Breathing | ***L O_2 | Daytime CPAP | Daytime BiPAP| Day Ventilator ▣

Control/Propulsion Ability: ▣ Pt | Caregiver ▣ is able to safely independently ▣ propel | control ▣ device.

Willingness: Pt (or caregiver if applicable) expressed the desire to use device.

Ruled Out	Physical Limitations	Impact
Pt is unable to safely and independently use the following within the home: ▣ No Device | Cane | Walker | Crutches | Standard Weight MWC | K0004 Lightweight MWC | K0005 Ultralight MWC | Tilt-In-Space MWC | Power-Operated-Vehicle | Group 2 PWC | Group 3 PWC ▣	**Due to impaired, limited and or abnormal:** ▣ active range of motion | autonomic function | balance | coordination | cardiovascular function | endurance | joint integrity | joint hypermobility | joint stability | passive range of motion | peripheral nerve function | posture | proprioception | respiratory function | safety awareness | sensation | trunk control | tone ▣ **And presence of:** ▣ chronic pain | destructive body mechanics | LE weakness | pain with movement | pain with weightbearing | spasticity | UE weakness ▣	**Due to their limitations without a ▣ K0004 Lightweight MWC | K0005 Ultralight MWC | Tilt-In-Space MWC | Power-Operated-Vehicle | Group 2 PWC | Group 3 PWC ▣ the following functional limitations and difficulties performing will persist or worsen:** ▣ functional mobility | transfers | health management | work tasks | school tasks | leisure activities | community participation | transporting objects | pain management | childcare | moving about the home | home management | driving ▣

Mobility Related Activities of Daily Living (MRADL)

Due to their mobility impairment the pt significantly limited in their ability to safely and independently complete the following components of their MRADL within a reasonable time. A *** would significantly improve their ability to perform these impacted tasks:

Feeding▣
- Move from the living space to the kitchen.
- Navigate through narrow kitchen spaces.
- Reaching and | or transporting supplies.
- Access varied surface heights needed for meal preparation.
- Achieve and maintain body positions required to safely eat.
- Endurance to complete cooking task. ▣

Grooming▣
- Reaching and | or transporting supplies.
- Maintain balanced while managing supplies, reaching, and grooming. ▣

Bathing▣
- Move from the living space to bathing area.

Toileting▣
- Move from the living space into bathroom area.
- Navigate through narrow doors | hallways.
- Turning and positioning to set up for toilet transfers.
- Performing toilet transfer.
- Maintain balance while managing body parts, clothing, related medical supplies, and toileting supplies.
- Catheterize from wheelchair.
- Turning and positioning to access sink for hand hygiene. ▣

Dressing▣
- Gathering, transporting, and managing clothing and dressing aids.

- Navigating through narrow doors | hallways.
- Turning and positioning to set up for tub | shower transfer.
- Transfer into tub | shower.
- Maintain safe and stable positioning while bathing.
- Reaching and managing supplies and body parts. ▣
- Turning and positioning to set up for transfers to ideal dressing surface.
- Performing transfer to dressing surface.
- Positioning body and managing extremities for dressing.
- Maintain balance and stability while dressing and reaching.
- Dressing from wheelchair. ▣

Table 10. Device Components

Device Components	
▣ K0004 Lightweight MWC | K0005 Ultralight MWC | Tilt-In-Space MWC ▣	
Selection	**Justification**
Model	
*** **Trialed and ruled out:** ***	Other notes: ***
Frame Type	
▣ Rigid | Folding | Heavy Duty | Very Heavy Duty ▣	A ▣ K0003 | K0004 ▣ is not appropriate due to the pt's ▣ high activity level | need for a wheelchair to all functional mobility| nonstandard seat depth | nonstandard seat width | nonstandard seat height ▣ and need for ▣ adjustable axle configuration | wheel camber | seat/back angle | body habitus/size|severe spasticity ▣ to achieve optimal wheelchair propulsion mechanics and stability reducing shoulder/neck strain and improve quality of life. **These cannot be accommodated by a K0001 through *** MWC.**
Seat Functions	
▣ NA/Tilt/Recline/Elevating Legrests ▣	**Required due to:** ▣ NA | perform pressure relief | reduce risk of pressure injuries | catheterization | dressing | shear reduction | repositioning | control of edema | management of tone/spasticity | LE contracture prevention | improved circulation | reduce gravity's effect on joints | reduce pain | maintain back and hip angle ROM | bladder management from wheelchair ▣
Head Support	
Headrest model: *** **Headrest Type:** ▣ None | Headrest ▣ **Hardware:** ▣ None | Adjustable/Removable Hardware | Headrest Extension Hardware | Universal Headrest Mounting Plate | Integrated Headrest Mount | Flex Lock Hardware with Quick Release ▣	**Require to:** ▣ NA | fit to the user to provide head and neck support, and stability, while preventing strain or injury ▣ **Hardware:** ▣ *NA | Required to mount headrest to backrest and maintain adjustability. ▣
Arm Support	
Armrest: ▣ None | Tubular Swing Away | Tubular Flip-Back | T-Post Height Adjustable Removable | T-Post Height Adjustable Flip-Back ▣	**Required to:** ▣ accommodate height | maintain postural alignment | improve balance | improve trunk control | reduce fatigue | fit under varied surface height | move out of the way for transfers | weight bearing pressure relief | minimize shear forces | reduce pressure | support hemiplegic arm | contain UEs | contain uncontrolled arm movements | protect against injury from inattention | reduce pain | prevent UE from falling ▣

Additional Arm Supports: ▣ Gel Armrest Pads | Arm Trough | Lateral Arm Roll | Elbow Support | Lateral Forearm Support | Adjustable/Removable Hardware ▣	
Back & Chest Support	
Backrest Model: *** **Backrest Type:** ▣ Solid | Tension Adjustable | Sling | Custom - less supportive options have been insufficient ▣ **Contour:** ▣ None | Contoured | Tension Adjustable | Custom ▣ **Cover:** ▣ Spacer Fabric Cover | Breathable Cover | Incontinence-Proof Cover **Back Hardware:** ▣ Fixed Canes | Height Adjustable Extensions | Locking Fold-Down Back ▣ **Chest Support:** ▣ None | Chest Strap/Harness | Shoulder Harness | Abdominal Support Panel ▣ **Additional Back Support:**▣ None | Privacy Flap | Lateral Trunk Supports with Swing Away Hardware | Growth kit | Extended Thoracic Support | Vertical Back Reinforcement - due to tone/spacticity | Mesh Panels ▣ **Trialed and Ruled out:** ***	**Required back support for positioning while seated in WC in addition to being necessary in order to -** **Maintain:** ▣ neutral | upright | midline | hygienic | secure ▣ seating and posture **Reduce:** ▣ flexible scoliosis | flexible kyphosis | misalignment | lateral tendency | pressure on bony prominences and nerves | moisture build-up| skin irritation | pain | risk of pressure injury | overheating | excessive energy expenditure while sitting | risk of secondary complications over time | flexibility into destructive positioning ▣ **Accommodate and Correct for:** ▣ fixed posture | fixed scoliosis | fixed kyphosis | rib deformity | unique body dimensions | aging with disability | anticipated weight fluctuation ▣ **Improve:** ▣ functional reach | trunk stability/support | sitting balance | lateral stability | ventilation | less supportive options have been insufficient ▣ **Hardware:** ▣ properly adjust to pt's body | enable transfers | enable safe loading, transport, and management when not in use ▣ Required in order to achieve ▣ engagement, participation, modified independence, reduced dependence ▣ during ADLs/iADL/meaningful activity engagement and functional task performance.
Pelvis Support	
Cushion Model: *** **Cushion Type:** ▣ General Use | Skin Protecting | Positioning | Skin Protecting and Positioning | Custom Molded ▣ **Contour/Properties:** ▣ None | Enveloping | Offloading | Immersion |Contoured | Custom ▣ **Seat Belt:** ▣ Pelvic Positioning Belt | Padded Pelvic Positioning Belt | 4-Point Padded Pelvic Positioning Belt ▣ **Additional Pelvis Supports:** ▣ Incontinence Liner | ATI (Adjustable Technology Insert-seat insert) | Solid Seat Insert | Solid Seat Pan Insert ▣ **Trialed and Ruled out:** ***	Required seat cushion for positioning while seated in WC in addition to being necessary in order to - **Maintain:** ▣ neutral | upright | midline | safe | cushion shape | hygienic | secure ▣ seating and posture **Reduce:** ▣ flexible pelvic tilt | sacral sitting | flexible pelvic rotation | windswept posture| pelvic obliquity | misalignment | lateral tendency | pressure on bony prominences and nerves | moisture build-up | skin irritation | pain | risk of pressure injury | overheating | risk of secondary complications over time | flexibility into destructive positioning | seat sling hammocking effect ▣ **Accommodate and Correct for:** ▣ fixed posture | fixed pelvic tilt | fixed pelvic obliquity | fixed pelvic rotation | unique body dimensions | aging with disability ▣

	Improve: ▣ functional reach |pelvic stability/support | sitting balance | functional reach | seatbelt compliance | stable base of support | less supportive options have been insufficient ▣ **Hardware:** ▣ properly adjust to pt's body | enable transfers ▣ Required in order to achieve ▣ engagement, participation, modified independence, reduced dependence ▣ during ADLs/iADL/meaningful activity engagement and functional task performance.
Leg Support	
Leg Support: ▣ Calf Strap | Padded Calf Strap | Calf Pads | Medial Thigh Support with Adjustable/Removable Hardware | Lateral Thigh Support with Adjustable/Removable Hardware | Residual Limb Support with Quick release/Swing-Away Hardware ▣	**Required in order to:** ▣ maintain LE position | prevent LE slipping/injury | prevent postural abnormalities | maintain thigh position | allow for safe transfers and adjustment | correct for pelvic obliquity ▣
Foot Support	
Footplate Type: ▣ Two-piece | One-piece ▣ **Footplate Mechanism:** ▣ Fixed-Angle | Angle-Adjustable | Flip-Up | High Mount (***") ▣ **Additional Foot Support:** ▣ None | Heel Loops | Ankle Huggers | Padded Footplates | Gel Padded Footplates | Padded Foot Box ▣	**Required in order to:** ▣ maintain alignment | prevent injury| position feet | secure foot on footplate| prevent deformity| accommodate foot angle| maintain floor access for transfers | prevent pressure injury | protect feet from inattention injury ▣
Frame Accessories	
Push Handles: ▣ None | Integrated | Fold-Down | Bolt-On Height-Adjustable | Center Mount Stroller Handle ▣ **Wheel Locks:** ▣ Extension Handles | Push to Lock | Pull to Lock | Scissor Locks | Grade Aids | Hemi-lock | Foot Operated Caregiver Lock ▣ **Anti-tippers:** ▣ Anti-tips | Flip-Up Anti-tips | Caregiver Tipper Bar **Side Guards:** ▣ Removable | Thumb Hole | Fender Style | Flip Back | Fold Down | Non-removable ▣ **Other Frame Accessories:** ▣ None | Transit Brackets | Tray with Removable Hardware | Oxygen Holder | Crutch Holder | Miller's Hardware Reinforcement ▣	**Required in order for:** ▣ Caregiver to effectively push WC at appropriate height/angle if pt is fatigued/in pain, facing steep ramp, or needs help aligning WC | full access to wheel locks | chair stability during transfers | skin protection during transfers | prevent backwards tips | aid in traversing floor transitions | cushion alignment | for safe wheelchair securement during transit | upper body positioning | ADL/IADL work surface | prevention of shoulder subluxation | reduction in shoulder subluxation pain | removal of tray for transfers | to hold medically necessary O2 tanks | to hold forearm crutch required for independent transfers | reinforcement to prevent WC damage from spasticity, abnormal tone, involuntary movements. ▣
Wheels	

Wheel Size: ***” with Quick Release Axles **Tire Type:** ▣ High Pressure Pneumatic Tires (Schwalbe Marathon Plus Evolution) | Solid Tires | Pneumatic Tires with Airless Insert | Mountain Bike/Knobby ▣ **Wheel Type:** ▣ Standard Spokes | Spinergy LX | Mag | Spokes with One Arm Drive ▣ **Handrims:** ▣ Standard Aluminum | Natural-Fit | Surge | Ergo | Plastic-Coated | Q-Grip | Projections ▣ **Casters:** ***” x ***” Soft Roll Casters	**Require for:** ▣ size needed for patients arm length | wheelchair breakdown for transport | decreased rolling resistance reduces joint strain | unable to perform pneumatic tire maintenance | aggressive tread required for rural terrain | Spinergy LX – open space for hand to move between spokes to allow for easy wheel removal for hand weakness and poor dexterity | allow for narrower frame width for home access | improved grip | improved propulsion efficiency | reduced wrist/hand pain | improved ergonomics | reduce risk for repetitive strain injury | improved safety with breaking | improved stability and suspension | reduce shock | decreased rolling resistance| overall decreased joint impact ▣
Power Assist	
PA Model: (***) **PA Type:** ▣ NA | 5th wheel | Pushrim-Activated Wheels ▣ **Switch Set Up:** ▣ NA | None | Buddy Button Switch | Dial ▣	**Pt is able to self-propel, but is limited by** ▣ UE weakness | endurance | hemiparesis | limited ROM | limited grip strength | *** instability | UE imbalance | UE amputation ▣ **Pt requires power assist during MRADLs and functional mobility to enable:** ▣ propulsion across high resistance surfaces such as carpet, rugs, and over threshold transitions | propulsion over longer community distances, slopes, and ramps | propelling to access bus stops and paratransit pickup locations ▣ **To reduce symptoms and risk of:** ▣ risk of shoulder injury | shoulder pain | UE pain | rotator cuff dysfunction | epicondylitis | repetitive strain injury | carpal tunnel syndrome ▣ **POV and PWC are not appropriate because:** ▣ pt’s home cannot accommodate the size of a PWC or POV| pt cannot safely operate a tiller| pt cannot safely transfer into a POV | pt cannot safely operate a heavy PWC due to *** ▣

Table 11. Device Components Example

Device Components	
K0005 Ultralight MWC	
Selection	**Justification**
Model	
Rogue 2 **Trialed and ruled out:** K0004 (Ki Mobility Catalyst 5), TiLite Aero T, TiLite Z	Other notes: Pt selected mono-tube design for ease of vehicle loading and Rogue 2 over Z for on-the-fly angle adjustable backrest feature.
Frame Type	
Rigid	A K0004 is not appropriate due to the pt's high activity level, need for a wheelchair to all functional mobility tasks and need for adjustable axle configuration, wheel camber, custom seat/back angle to achieve optimal wheelchair propulsion mechanics and stability reducing shoulder/neck strain and improving quality of life. These cannot be accommodated by a K0001 through K0004 MWC.
Seat Functions	
NA	**Required due to:** NA
Head Support	
Headrest model: none	**Require to:** NA
Arm Support	
Armrest: Tubular Flip-Back **Additional Arm Supports:** Adjustable/Removable Hardware	**Required to:** maintain postural alignment, reduce fatigue, fit under varied surface height, move out of the way for transfers, weight bearing pressure relief
Back & Chest Support	
Backrest Model: Ride Java Back - 14" w Regular 3" deep **Backrest Type:** Solid **Contour:** Contoured **Cover:** Breathable Cover **Back Hardware:** Fixed Canes, Locking Fold-Down Back **Chest Support:** None **Additional Back Support:** Privacy Flap **Trialed and Ruled out:** sling back, tension adjustable back, Jay 3 back did not provide enough lumbar support	**Required back support for positioning while seated in WC in addition to being necessary in order to -** **Maintain:** neutral, upright seating and posture **Reduce:** misalignment, lateral tendency, pain, flexibility into destructive positioning **Accommodate and Correct for:** ▣ fixed scoliosis, rib deformity **Improve:** trunk stability/support, sitting balance, lateral stability, less supportive options have been insufficient **Hardware:** properly adjust to pt's body, enable safe loading, transport and management when not in use Required in order to achieve modified independence and reduced dependence during ADLs/iADL/meaningful activity engagement and functional task performance.
Pelvis Support	
Cushion Model: Ride Java Seat **Cushion Type:** Skin Protecting and Positioning	Required seat cushion for positioning while seated in WC in addition to being necessary in order to -

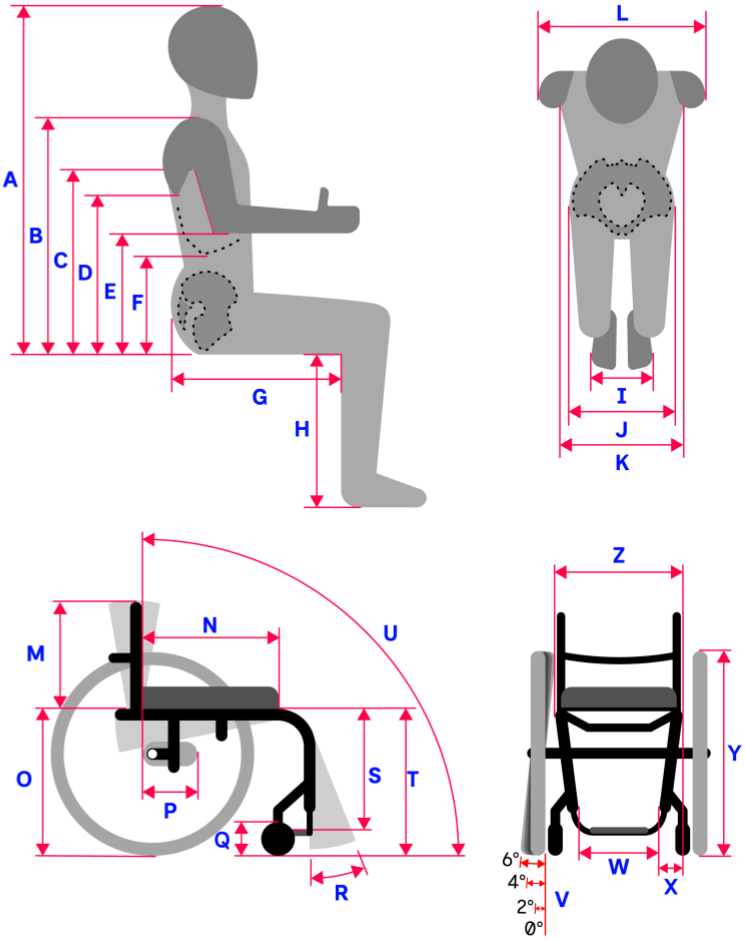
Contour/Properties Offloading, Contoured **Seat Belt:** Padded Pelvic Positioning Belt **Additional Pelvis Supports:** Solid Seat Insert **Trialed and Ruled out:** roho quadro failed to provide stability, TRU-Comfort 2 SPP was too soft aggravating sciatica	**Maintain:** ▣ neutral, safe, secure ▣ seating and posture **Reduce:** ▣ flexible pelvic tilt, sacral sitting, flexible pelvic rotation, lateral tendency, pressure on bony prominences and nerves, moisture build-up, skin irritation, pain, risk of pressure injury, overheating, flexibility into destructive positioning, seat sling hammocking effect **Accommodate and Correct for:** N/A **Improve:** pelvic stability/support, sitting balance, seatbelt compliance, stable base of support, less supportive options have been insufficient **Hardware:** properly adjust to pt's body Required in order to achieve modified independence and reduced dependence during ADLs/iADL/meaningful activity engagement and functional task performance.
Leg Support	
Leg Support: Padded Calf Strap	**Required in order to:** prevent LE slipping/injury
Foot Support	
Footplate Type: One-piece **Footplate Mechanism:** Angle-Adjustable **Additional Foot Support:** None	**Required in order to:** maintain alignment, position feet, accommodate foot angle
Frame Accessories	
Push Handles: Integrated **Wheel Locks:** Push to Lock **Anti-tippers:** Anti-tips **Side Guards:** Removable **Other Frame Accessories:** None	**Required in order for:** Caregiver to effectively push WC at appropriate height/angle if pt is fatigued/in pain, facing steep ramp, or needs help aligning WC, chair stability during transfers, prevent backwards tips, cushion alignment
Wheels	
Wheel Size: 24" with Quick Release Axles **Tire Type:** High Pressure Pneumatic Tires (Schwalbe Marathon Plus Evolution) **Wheel Type:** Spinergy LX **Handrims:** Surge **Casters:** 4" x 1.5" Soft Roll Casters	**Require for:** size needed for patients arm length, wheelchair breakdown for transport, decreased rolling resistance reduces joint strain, Spinergy LX – open space for hand to move between spokes to allow for easy wheel removal with hand weakness, improved grip, improved propulsion efficiency, reduced wrist/hand pain, improved ergonomics, reduce risk for repetitive strain injury, improved safety with breaking, reduce shock, overall decreased joint impact
Power Assist	
PA Model: None	**Pt is able to self-propel, but is limited by:** NA

Table 7. K0005 Measurements Template

K0005 Measurements

Body Measurements
- A – Head Height
- B – Shoulder Height
- C – Axilla Height
- D – Scapula Height
- E – Elbow Height
- F – Rib height
- G – Back to Knee
- H – Knee to Heel
- I – Foot Width
- J – Hip Width
- K – Chest Width
- L – Shoulder Width

Wheelchair Measurements
- M – Back Height
- N – Seat Depth
- O – Rear Seat Height
- P – Center of Gravity
- Q – Caster Size
- R – Frame Angle
- S – Seat to Footrest Height
- T – Seat to Floor Height
- U – Back Angle
- V – Camber
- W – Footrest Width
- X – Taper
- Y – Wheel Size
- Z – Seat Width



Body Measurements	Frame Measurements
A - Head Height: ***”	M - Back Height: ***”
B - Shoulder Height: ***”	N - Seat Depth: ***”
C - Axilla Height: ***”	O - Rear Seat Height: ***”
D - Scapula Height: ***”	P - Center of Gravity: ***”
E - Elbow Height: ***”	Q - Caster Size: ***”
F - Rib Height: ***”	R - Frame Angle: ***°
G - Back to Knee: ***”	S - Seat to Footrest Height: ***”
H - Knee to Heel: ***”	T - Seat to Floor Height: ***”
I - Foot Width: ***”	U - Back Angle: ***°
J - Hip Width: ***”	V - Camber: ***”
K - Chest Width: ***”	W - Footrest Width: ***”
L - Shoulder Width: ***”	X - Taper: ***”
	Y - Wheel Size: ***”
	Z - Seat Width: ***”

Table 8. ROM and Strength Assessment Template

ROM and Strength Assessment				
Joint (Action)	**ROM**	**MMT**	**Tone**	Modified Ashworth Scores (MAS) (0) normal tone (1) resistance at end ROM (1+) resistance in < 50% ROM (2) mild resistance > 50% ROM (3) passive movement difficult (4) rigid
Functional Grasp	L:*** R:* **	L:*** R:***	L:*** R:***	
Elbow Flex (140˚)	L:*** R:***	L:*** R:***	L:*** R:***	
Shoulder Flex (180˚)	L:*** R:***	L:*** R:***	L:*** R:***	
Hip Flex (100˚)	L:*** R:***	L:*** R:***	L:*** R:***	
Knee Flex (150˚)	L:*** R:***	L:*** R:***	L:*** R:***	
Knee Ext (0˚)	L:*** R:***	L:*** R:***	L:*** R:***	
Manual Muscle Testing (MMT) (0) no contraction (1) palpable contraction (2-) gravity eliminated movement (2) gravity eliminated full ROM (2+) gravity eliminated full ROM min resistance (3-) against gravity more than half but not full ROM (3) against gravity full ROM (3+) against gravity full ROM min resistance (4) against gravity full ROM mod resistance (5) against gravity full ROM max resistance				

Table 9. Orthostatic Vital Signs Template

Orthostatic Vital Signs		
Directions		**Norms**
Blood Pressure: Assume position then take blood pressure, repeat after 1-3 min. **Heart Rate:** Assume position monitor heart rate, record max spike or drop bpm.		**High fall risk from orthostatic hypotension:** • Systolic (top) BP drops >20 **AND | OR** • Diastolic (bottom) BP drops >10 **AND | OR** • BP drop with symptoms **High fall risk from postural tachycardia:** • HR drops >30bmp **AND | OR** • HR increases causing symptoms
Position	Heart Rate	Blood Pressure
Sitting	Initial: ***	Initial: ***
Standing	Initial: *** 1 min: *** 3 min: ***	Initial: *** 1 min: *** 3 min: ***
Walking	Initial: *** 1 min: *** 3 min: ***	N | A
Interpretation	Safe | Unsafe Fall Risk	

Table 10. FTSST Template

5x Sit to Stand			
Directions			**Norms**
Quickly go from sitting to standing 5x. **Position:** Arms crossed over chest. **Start Clock:** On "Go." **Stop Clock:** Body touches seat after 5th stand. **Score "Unable to Complete" if:** Uses arms or can't complete 5x.			**Interpretation:** Balance impairment >10s Fall risk > 12s High Fall risk > 15s
Time	***sec | Unable to Complete	Interpretation	Safe | Unsafe Fall Risk

Table 11. 30STS Template

30 Second Sit to Stand Test					
Directions			**Norms**		
Position: eyes open, hands-on hips, stand on 1 leg **Start Count:** on the word "Go" **Stop Count:** if patient uses arms or when time reaches 30 secs. **Interpretation:** Arm use = score of 0 Stand count < norm = fall risk			Age <60 65-69 70-74 75-79 80-84 85-89 90+	Men 14 12 12 11 10 8 7	Women 12 11 10 10 9 8 4
Stands	***	Interpretation	Safe | Unsafe Fall Risk		

Table 12. 10MWT Template

10 Meter Walk Test					
Directions				**Norms**	
Walk at a comfortable pace. **Interpretation:** <0.9 = nonfunctional ambulator				Age <29 30-69 70s 80+	(m/s) 1.3 1.4 1.2 1.0
Time	***sec	Speed	*** m | s	Interpretation	

Table 13. OLST Template

One-legged Stance Test					
Directions				**Norms**	
Position: eyes open, hands-on hips, stand on 1 leg **Start Clock:** foot leaves floor **Stop Clock:** foot touches floor OR 1 or both hand leaves hips **Interpretation:** time < norm = fall risk time <5s = very high injury risk				Age <40 40-49 50-59 60-69 70-79 80+	Secs 43 40 37 27 15 6
Time	***sec	Interpretation	Safe | Unsafe Fall Risk		

Table 14. Abbreviated FGA Template

Abbreviated FGA			
Step Over 2 Obstacles (4.5" and 9") Test			
Directions		**Norms**	
Walk at normal speed, without stopping step over (not on or around) all obstacles, and keep walking.		**(3) None:** Clears 9" box, gait speed unchanged, no imbalance. **(2) Mild:** Clears 4.5" box, speed unchanged, no imbalance. **(1) Mod:** Clears 4.5", slows speed, adjusts footing. **(0) Severe:** Fails to clear box without assistance and | or becoming unsteady.	
Score	***	**Interpretation**	Safe | Unsafe Fall Risk
Gait with Narrow Base of Support Test			
Directions		**Norms**	
Arms crossed, walk heel to toe for 10 steps in straight line.		**(3) None:** 10 steps without staggering, no assistance. **(2) Mild:** 7-9 steps without staggering, no assistance. **(1) Mod:** 4-7 steps without staggering, no assistance. **(0) Severe:** 0-3 steps, no assistance.	
Score	***	Interpretation	Safe | Unsafe Fall Risk
Steps Test			
Directions		Norms	
Walk up these stairs as you normally would, at the top, turn around and walk down.		**(3) None:** Alternating feet (1 foot per step), no rail. **(2) Mild:** Alternating feet (1 foot per step) with rail. **(1) Mod:** Two feet per step with rail. **(0) Severe:** Can't safely complete.	
Score	***	Interpretation	Safe | Unsafe Fall Risk

Table 15. Balance Assessment Template

Balance Assessment	
Sitting Balance	**Surface: ***** **Type:** ▣ hands free | hands dependent | propped ▣ **Static:** ▣ poor | fair | good ▣ **Dynamic:** ▣ poor | fair | good ▣
Standing Balance	**Device: ***** **Static:** ▣ unable | poor | fair | good ▣ **Dynamic:** ▣ unable | poor | fair | good ▣

Figure 5. Wheelchair Type Decision Tree

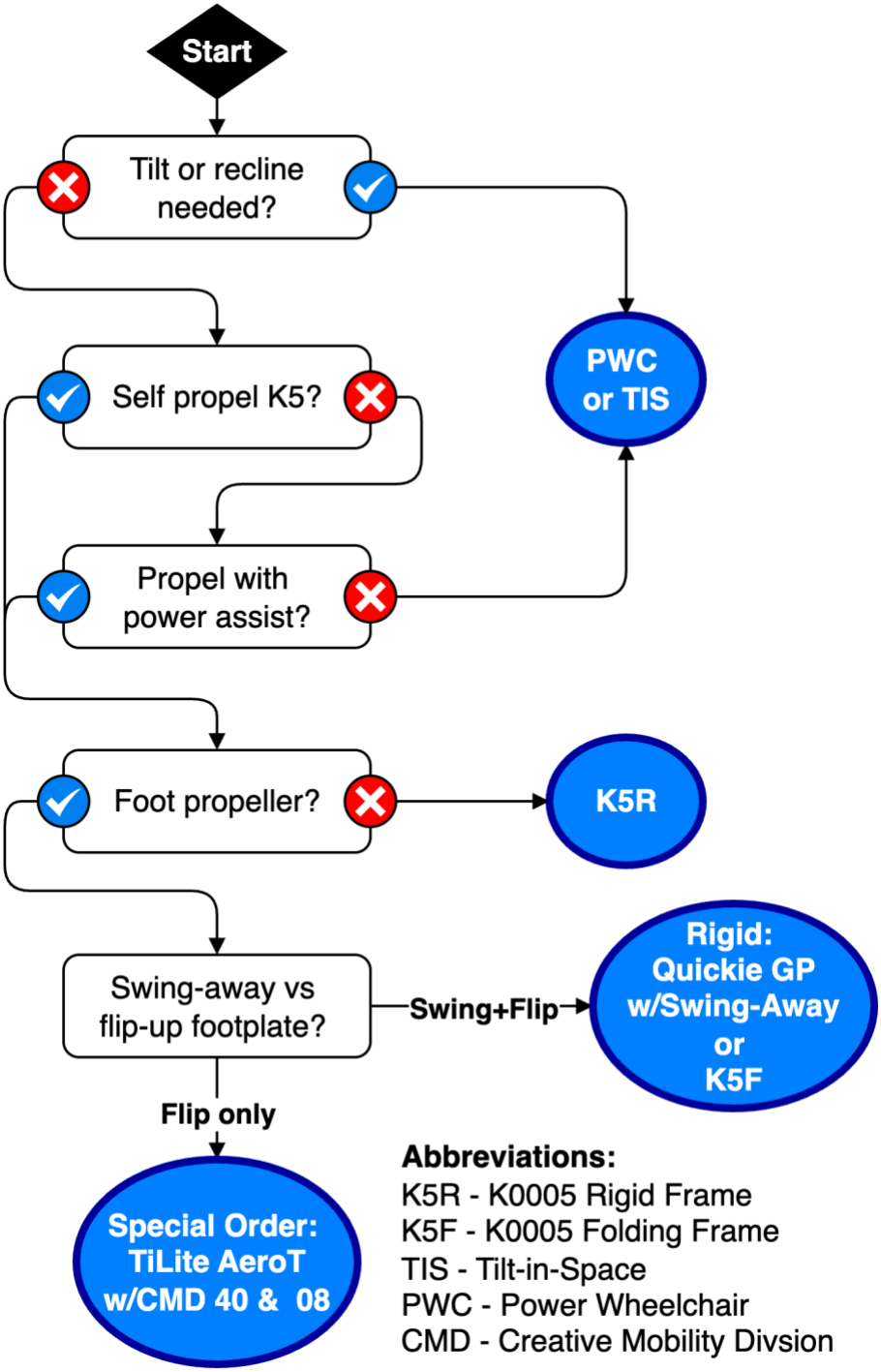


Figure 1. MWC K0005 Rigid Frame Models by User Weight

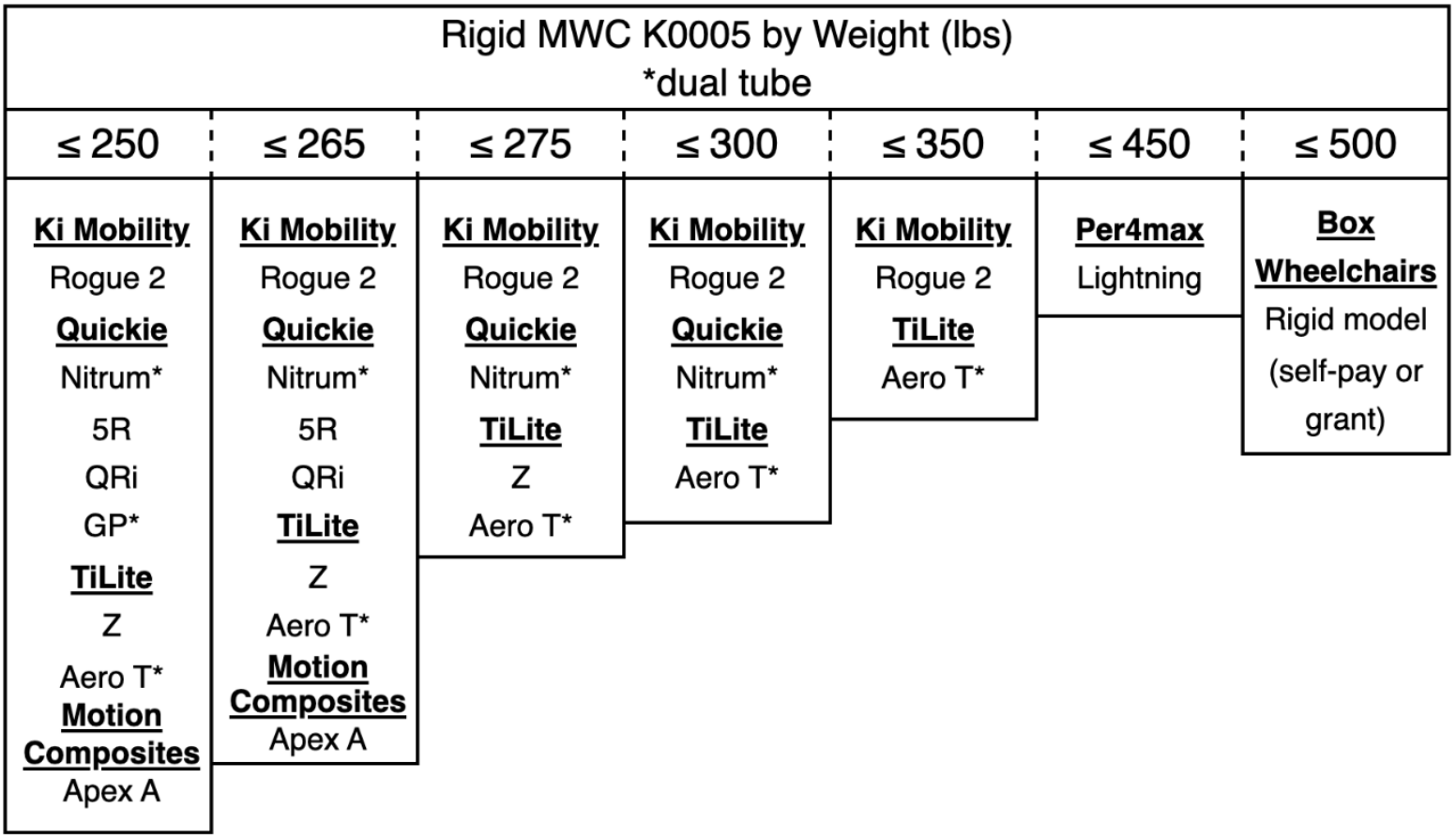


Figure 2. MWC K0005 Folding Frames Models by User Weight

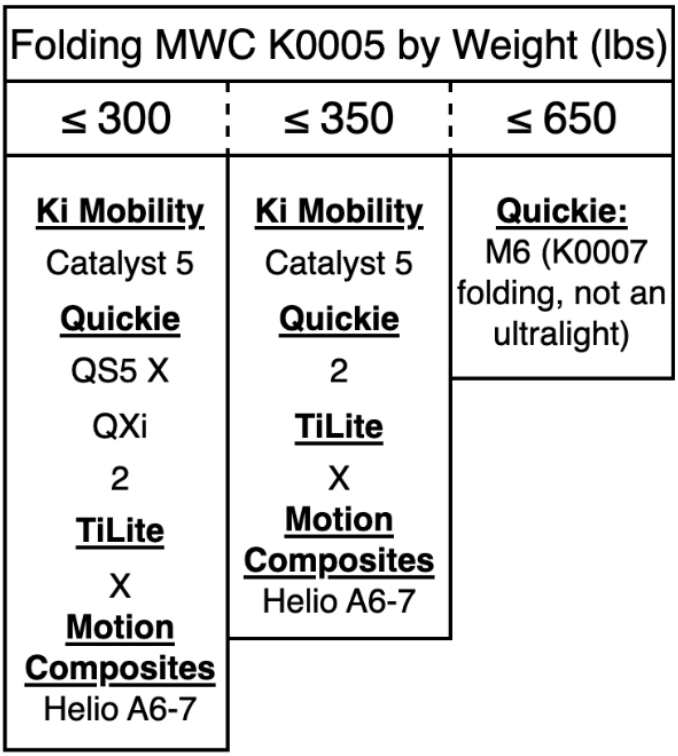


Figure 3. Alternative Drive Controls Decision Tree

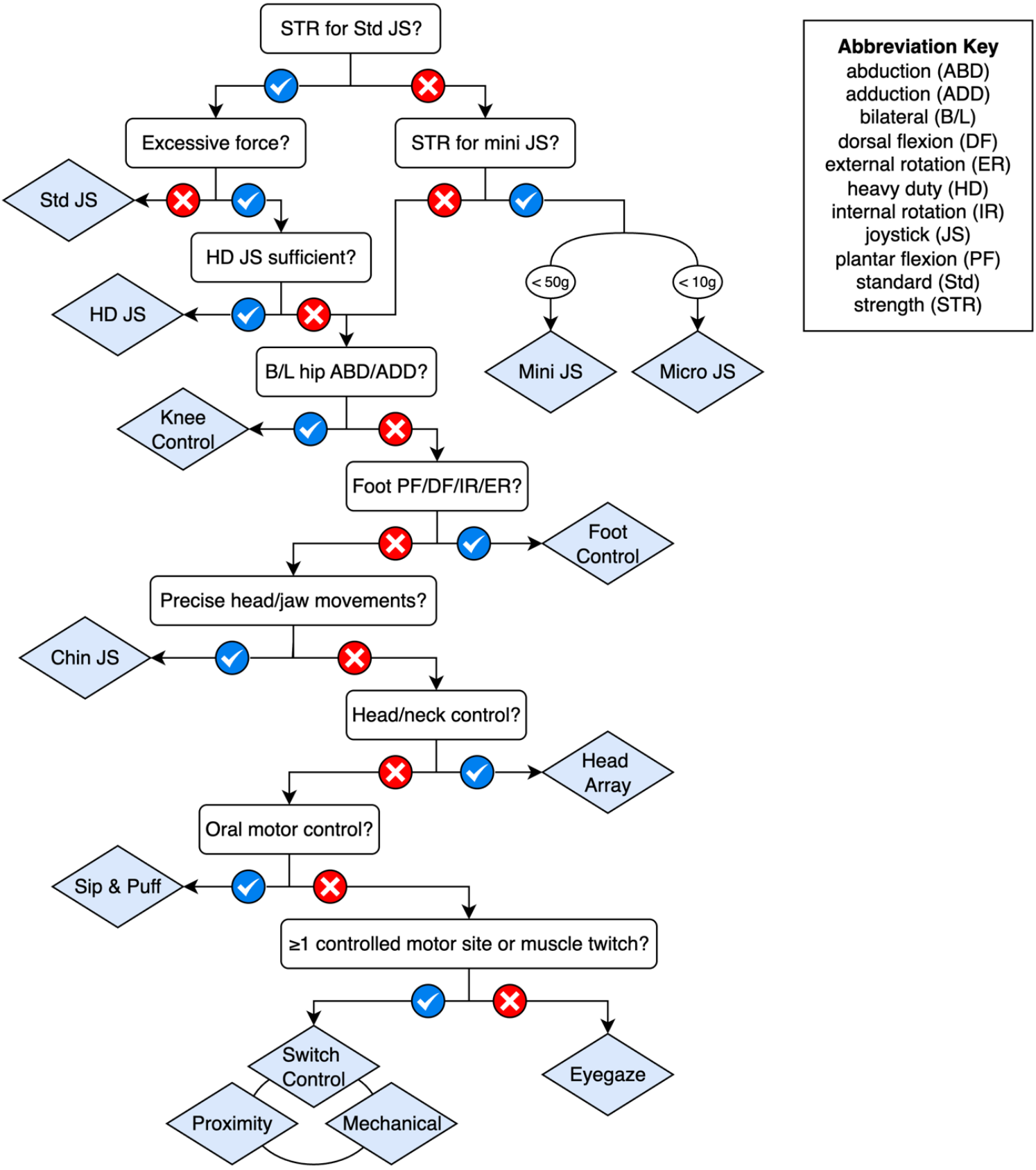


Figure 4. Tire Selection & Delivery Caution

MWC Tire Type

Tire type affects how hard a wheelchair is to push.

High pressure pneumatic (HPP) tires are easiest to push.

For a 250-lb patient, different tire types can make it feel like they carrying a weighted backpack:

- HPP at 100-120 psi – 0 lbs
- HPP 60% flat – 15 lbs
- Solid tire – 35 lbs
- **Airless inserts – 96 lbs**

Airless inserts are the enemy of shoulder health.

https://www.wheelchairstandards.pitt.edu/sites/default/files/fact-sheets/wheel_rolling_resistance_overview.pdf

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Recent Delivery Issue

K5's are ordered with high pressure tires but delivered with low pressure.

- **Trail & Spec Apt:** Specify vendor selects **"Schwalbe Marathon Plus Evolution"**
- **Delivery:** Double-check **(LP tire color changed, black tires ≠ guarantee of HP)**
- **Follow-Up:** Follow-up with past pts to make sure correct tire was delivered.

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What to do When Pt Refuses Air

Educate, if that fails then do solid tires, not Airless inserts.

Here are options for common WC manufacturers:

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Figure 5. Wheelchair Propulsion Patient Handout Triceps Version

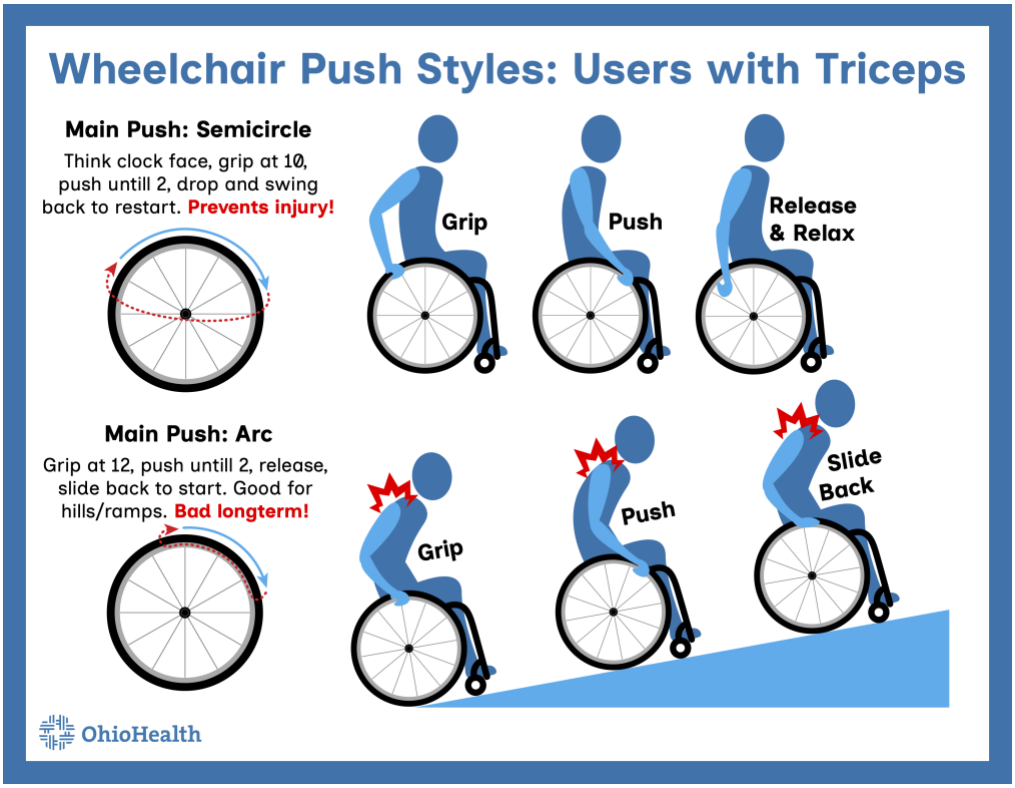
Wheelchair Push Styles: Users with Triceps
Main Push: Semicircle
Think clock face, grip at 10, push untill 2, drop and swing back to restart. Prevents injury!
Grip
Push
Release & Relax
Main Push: Arc
Grip at 12, push untill 2, release, slide back to start. Good for hills/ramps. Bad longterm!
Grip
Push
Slide Back
OhioHealth

Figure 6. Wheelchair Propulsion Patient Handout No Triceps Version

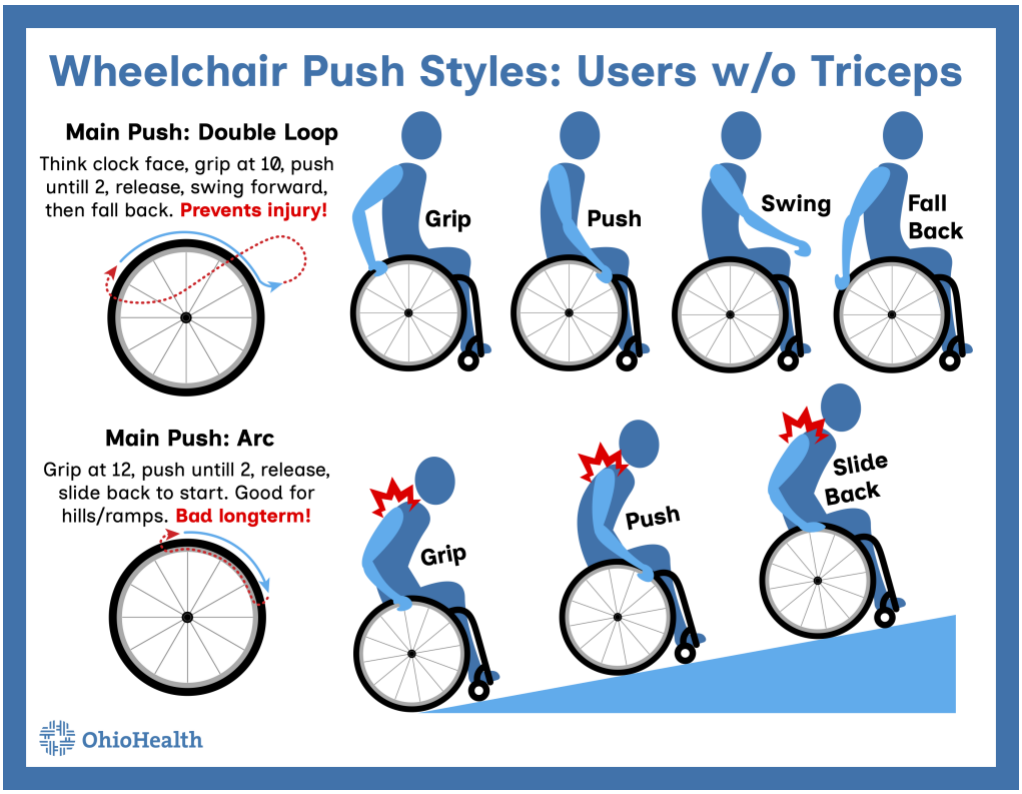
Wheelchair Push Styles: Users w/o Triceps
Main Push: Double Loop
Think clock face, grip at 10, push untill 2, release, swing forward, then fall back. Prevents injury!
Grip
Push
Swing
Fall Back
Main Push: Arc
Grip at 12, push untill 2, release, slide back to start. Good for hills/ramps. Bad longterm!
Grip
Push
Slide Back
OhioHealth

Figure 7. Wheelchair Scale Platform Diagram